

REMARKS

Favorable reconsideration of this application, in view of the present amendment and in light of the following discussion, is respectfully requested.

Claims 1-18 are currently pending. Claims 1-18 have been amended by the present amendment. The changes to the claims are supported by the originally filed specification and do not add new matter.

In the outstanding Office Action, Claims 2, 4, and 6 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement regarding the phrase “differential phase obtained by inverting the hard decision data”; Claims 2, 4, and 6 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement regarding the claimed “minimum or maximum survival path metric”; Claims 4 and 6 were rejected under 35 U.S.C. §112, second paragraph, regarding the definition of “reliability information”; Claims 1 and 7 were rejected under 35 U.S.C. §103(a) as being unpatentable over “the admitted prior art in Figure 10” (hereinafter “the Background Art”) in view of U.S. Patent No. 5,706,313 to Blasiak et al. (hereinafter “the ‘313 patent”) and U.S. Patent No. 5,996,104 to Herzberg (hereinafter “the ‘104 patent”); Claims 3, 5, 9, and 11 were rejected under 35 U.S.C. §103(a) as being unpatentable over the Background Art in view of the ‘313 and ‘104 patents, further in view of U.S. Patent No. 6,269,124 to Nagayasu et al. (hereinafter “the ‘124 patent”); Claims 8, 13, and 14 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,574,283 to Sakoda et al. (hereinafter “the ‘283 patent”) in view of the Background Art, the ‘313 patent, and the ‘104 patent; and Claims 10, 12, and 15-18 were rejected under 35 U.S.C. §103(a) as being unpatentable over the ‘283 patent in view of the Background Art, the ‘313 patent, the ‘104 patent, and the ‘124 patent.

Applicants wish to thank the Examiner for the interview granted Applicants' representative on April 4, 2005, at which time the outstanding rejections of the claims were discussed. Specifically, the rejections of Claims 2 and 4 under 35 U.S.C. §112 were discussed. In addition, the teachings of the '104 patent were discussed. However, no agreement was reached pending the Examiner's further consideration of the claims upon formal submission of a response to the outstanding Office Action.

Applicants respectfully submit that the rejections of Claims 2, 4, and 6 under 35 U.S.C. §112, first paragraph (written description), are rendered moot by the present amendment to those claims. Claims 2, 4, and 6 have been amended to no longer recite the inversion of hard decision data.

Applicants respectfully submit that the rejections of Claims 2, 4, and 6 under 35 U.S.C. §112, first paragraph (enablement), are rendered moot by the present amendment to those claims. Claims 2, 4, and 6 have been amended to no longer recite the word "maximum."

Applicants respectfully submit that the rejection of Claims 4 and 6 under 35 U.S.C. §112, second paragraph, regarding the definition of "reliability information" is rendered moot by the present amendment to Claims 3-6.

Claim 1 is directed to a demodulator, comprising: (1) a multiple differential phase detected signal output unit configured to calculate phase differences between a received signal and previously received signals of 1, 2,..., N symbols (where N is an integer greater than 2) so as to output 1, 2,..., N symbol differential phase detected signals; and (2) a soft decision demodulated data estimating unit configured to estimate a transmitted differential phase sequence according to the 1, 2,..., N symbol differential phase detected signals using a trellis diagram representing transitions of differential phase states of transmitted signals and a Viterbi algorithm, and to estimate soft decision demodulated data according to the estimated

transmitted differential phase sequence and a survival path metric that transits into each state on the trellis diagram. Further, Claim 1 has been amended to recite that the soft decision demodulated data are estimated as the product of hard decision data and reliability information, and that the reliability information is calculated by subtracting a likelihood for a first survival path metric having a first state on the trellis diagram from a likelihood for a second survival path metric having a second state on the trellis diagram. No new matter has been added.¹

Applicants respectfully submit that the rejection of Claim 1 under 35 U.S.C. §103(a) is rendered moot by the present amendment to Claim 1.

Regarding the rejection of Claim 1, the Office Action asserts that the Background Art discloses everything in Claim 1 with the exception of the soft decision demodulated data estimating unit, and relies on the '313 and '104 patents to remedy that deficiency.

The Background Art is directed to a multiple differential phase detector 500, as shown in Figure 10. However, as admitted in the Office Action, the Background Art fails to disclose the soft decision demodulated data estimated unit recited in Claim 1.

The '313 patent is directed to a soft decision digital communications method and apparatus for decoding a coherent differentially encoded multilevel phase-shift keyed (DEPSK) modulated signal. The '313 patent discloses that the metric computer 201 generates a soft decision metric corresponding to the coherent DEPSK modulated signal, which is then forwarded to a Forward Error Correction (FEC) decoder 107. However, as admitted in the Office Action, the '313 patent fails to disclose that the reliability information is defined as a difference between two of the survival path metrics, as recited in amended Claim 1.

¹ See, e.g., Figure 4 and the discussion related thereto in the specification. In particular, see page 32, line 19, to page 34, line 7 of the specification.

The '104 patent is directed to a method and apparatus for coding an information signal. Further, as shown in Figure 5, the '104 patent discloses a soft-in soft-out decoder 51.

Further, the '104 patent discloses that

the desired soft output can be approximated by multiplying the hard decision with an estimation for the reliability of the measurement. In the SOVA the reliability is evaluated by measuring the difference between a survival path and the path that has the closest accumulative metric. As this difference increases the reliability of the measurement increases since the difference between the accumulated metric of the survival path and that of the remaining paths increases.²

However, Applicants respectfully submit that the '104 patent fails to disclose that the reliability information is calculated by subtracting a likelihood for a first survival path metric having a first state on the trellis diagram from a likelihood for a second survival path metric having a second state on the trellis diagram, as recited in amended Claim 1. Rather, the '104 patent discloses that the reliability information is evaluated by measuring the difference between a survival path and a path that has the closest accumulated metric.

Thus, no matter how the teachings of the Background Art, the '313 patent, and the '104 patent are combined, the combination does not teach or suggest that the reliability information is calculated by subtracting a likelihood for a first survival path metric having a first state on the trellis diagram from a likelihood for a second survival path metric having a second state on the trellis diagram, as recited in amended Claim 1. Accordingly, Applicants respectfully submit that Claim 1 patentably defines over any proper combination of the Background Art, the '313 patent, and the '104 patent.

Claim 7 recites limitations analogous to the limitations recited in Claim 1. Accordingly, for the reasons stated above for the patentability of Claim 1, Applicants

² See '104 patent, column 7, lines 22-30.

respectfully submit that the rejection of Claim 7 is rendered moot by the present amendment to Claim 7.

Applicants respectfully submit that the rejections of independent Claims 3, 5, 9, and 11 are rendered moot by the present amendment to those claims. Claims 3, 5, 9, and 11 have been amended to recite limitations analogous to the limitations recited in Claim 1. In particular, each of Claims 3, 5, 9, and 11 recite that the reliability information is calculated by subtracting a likelihood for a first survival path metric having a first state on the trellis diagram from a likelihood for a second survival path metric having a second state on the trellis diagram. However, as discussed above, the Background Art, the '313 patent, and the '104 patent each fail to disclose that the reliability information is calculated by subtracting a likelihood for a first survival path metric having a first state on the trellis diagram from a likelihood for a second survival path metric having a second state on the trellis diagram, as recited in amended Claims 3, 5, 9, and 11.

The '124 patent is directed to a data transmission system, receiver, and recording medium in which a soft decision circuit 18 outputs soft decision data so as to decrease the number of different bits between the pseudo transmission signals and the received signals, and the received data are generated based on the soft decision data. However, Applicants respectfully submit that the '124 patent fails to cure the deficiencies of the Background Art, the '313 patent, and the '104 patent, as discussed above. In particular, the '124 patent fails to disclose that the reliability information is calculated by subtracting a likelihood for a first survival path metric having a first state on the trellis diagram from a likelihood for a second survival path metric having a second state on the trellis diagram, as recited in Claims 3, 5, 9, and 11. Accordingly, Applicants respectfully submit that Claims 3, 5, 9, and 11 patentably define over any proper combination of the Background Art, the '313 patent, the '104 patent, and the '124 patent.

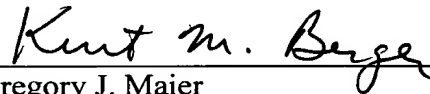
Applicants respectfully traverse the rejection of Claims 8, 10, and 12-18 under 35 U.S.C. §103(a). Claims 8, 10, and 12-18 recite limitations analogous to the limitations recited in Claim 1. In particular, Claims 8, 10, and 12-18 recite that the reliability information is calculated by subtracting a likelihood for a first survival path metric having a first state on the trellis diagram from a likelihood for a second survival path metric having a second state on the trellis diagram. However, as discussed above, the Background Art, the '313 patent, the '124 patent, and the '104 patent each fail to disclose that the reliability information is calculated by subtracting a likelihood for a first survival path metric having a first state on the trellis diagram from a likelihood for a second survival path metric having a second state on the trellis diagram. Further, Applicants respectfully submit that the '283 patent also fails to disclose that the reliability information is calculated by subtracting a likelihood for a first survival path metric having a first state on the trellis diagram from a likelihood for a second survival path metric having a second state on the trellis diagram, as recited in amended Claims 8, 10, and 12-18. Accordingly, Applicants respectfully submit that amended Claims 8, 10, and 12-18 patentably define over any proper combination of the '283 patent, the '313 patent, the '104 patent, the '124 patent, and the Background Art.

Thus, it is respectfully submitted that independent Claims 1, 3, 5, and 7-18 (and all associated dependent claims) patentably define over any proper combination of the Background Art, and the '313, '104, '124, and '283 patents.

Consequently, in view of the present amendment and in light of the above discussion, the outstanding grounds for rejection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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